



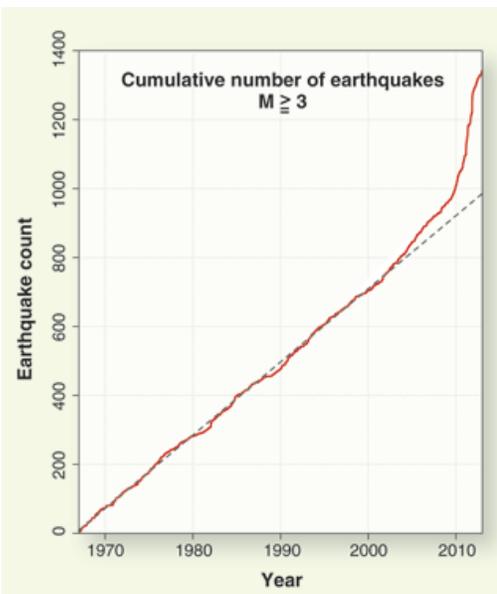
EARTHQUAKES AND HYDRAULIC FRACTURING

EARTHWORKS FACT SHEET

Hydraulic fracturingⁱ (aka fracking) injects millions of gallons of water, sand and chemicals at high enough pressure to break apart geologic formations deep underground, releasing oil and gas to flow up the oil/gas well.

Peer reviewed scientific studies and government research both demonstrate that fracking wastewater injection, and to a lesser extent, fracking itself, can induce earthquakes.

Fracking wastewater injection and earthquakes



Earthquakes with magnitude (M) ≥ 3 in the U.S. midcontinent, 1967–2012. Source: Science Magazine.

Significant earthquakes have been scientifically linked to fracking wastewater injection in at least five states: Arkansas, Colorado, Ohio, Oklahoma, and Texas.

The largest of these was a 5.7 magnitude earthquake in Prague, OK, which was the biggest in the state's history. It destroyed 14 homes, damaged infrastructure and numerous buildings, and injured two people.ⁱⁱ

Overall, midcontinent earthquakes, where there are few active faults, drastically increased in 2011-2012 in association with the fracking-enabled oil and gas boom.

Fracking and earthquakes

Fracking essentially is a series of small manmade earthquakes. This seismic activity on its own is small and typically cannot be felt at the surface.

However, recent studies have reported that fracking has induced earthquakes of magnitudes 2 and 3 in Oklahoma and British Columbia.ⁱⁱⁱ

Gaps exist in the science of fracking and wastewater injection induced earthquakes

Although fracking and wastewater injection are linked to earthquakes, no studies have determined the nature of that relationship. For example, we do not know:

- The maximum possible magnitude that can be reached by quakes induced by fracking or



wastewater injection.

- The maximum distance from which fracking or wastewater injection could induce a quake.
- Why some frack jobs and wastewater injection wells induce quakes, and others not.
- How long the risk of a quake persists after a frack job or wastewater injection occurs.^{iv}

Oversight of fracking and wastewater injection induced earthquakes is nonexistent

EPA could regulate fracking wastewater injection wells, but it has largely delegated its authority to the states.^v

Although the National Academy of Sciences has called for regulators to take steps to prevent fracking-related earthquakes^{vi}, there have been none. Nor has there been any meaningful regulatory attempt to monitor these quakes.^{vii}

However, given the gaps in the science of the issue, regulators currently don't know how to safely regulate fracking-quake risk even if they wanted to.

Property owners, not fracking companies, are liable for earthquake damage

Lack of monitoring has one very significant consequence to property owners: because regulators don't monitor fracking-related quakes, they cannot assign financial liability for the damages caused by the quake to the company responsible.

Instead, property owners (and taxpayers, when damages occur to infrastructure) must pay.^{viii}

Particularly in parts of the country where earthquakes were previously uncommon and infrastructure was not built to withstand seismic activity, even smaller earthquakes can cause significant, expensive and dangerous damage.

ⁱ Earthworks, *Hydraulic Fracturing 101*. Accessed January 13, 2014 at <http://www.earthworksaction.org>

ⁱⁱ Ellsworth, W.L. (2013); Keranen, K.M. et al. (2013). *Potentially induced earthquakes in Oklahoma, USA: links between wastewater injection and the 2011 Mw 5.7 earthquake sequence*. *Geology* 41: 699–702.

ⁱⁱⁱ *Ibid*

^{iv} Keranen, K.M. et al. (2013). *Potentially induced earthquakes in Oklahoma, USA: links between wastewater injection and the 2011 Mw 5.7 earthquake sequence*. *Geology* 41: 699–702.

^v U.S. Environmental Protection Agency website, *Class II Wells - Oil and Gas Related Injection Wells (Class II)*. Retrieved Jan 13, 2014 at <http://water.epa.gov/type/groundwater/uic/class2/>

^{vi} National Research Council, Division on Earth and Life Studies, Board on Earth Sciences and Resources, *Induced Seismicity Potential in Energy Technologies*. Retrieved Jan 13, 2014 at the National Academies Press website: http://www.nap.edu/catalog.php?record_id=13355

^{vii} Energywire, Mike Soraghan, *States deciding not to look at seismic risks of drilling*, March 25, 2013. Retrieved Jan 13, 2014 at <http://www.eenews.net/energywire/stories/1059978378> (subscription required)

^{viii} Energywire, Mike Soraghan, October 31, 2013. *Okla. official recommends quake insurance to residents*. Retrieved Jan 13, 2014 at <http://www.eenews.net/energywire/stories/1059989714> (subscription required)

